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Bulletin of the

Society for the Promotion of Engineering Education

VOL. X LANCASTER, PA., SEPTEMBER, 1919 NO. 1

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BULLETIN

OF THE

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REFLECTIONS OF AN S. P. E. E. PRESIDENT.

BY JOHN F. HAYFORD.

The title selected for this address is purposely non-committal. "Reflections of an S. P. E. E. President" is a phrase that may be interpreted, with a mirror in mind, as meaning that your own ideas are to be thrown back to you. The address may be an epitome of what you yourselves have thought and said. On the other hand the Standard Dictionary says

that "Reflection increases wisdom." In that sense of the word when an intelligent being reflects upon what he observes or hears, the statement of his reflections contains something original. The Secretary of the society, its mainspring that keeps the works going, and the assistant to the Secretary, the hairspring that attends to each separate (k)tick, both insisted many weeks ago that I must furnish a title for this address. I am glad I made it non-committal.

After all, it is of little importance whether my reflections are of the one kind, the consensus of your thoughts put into words, or of the other kind, original. As is usual with the work of an engineer, it is relatively immaterial whether it is original or not. It is all important that it be right. I would like to help toward correct conclusions.

I have had a rare opportunity not given to my predecessors. I have presided over three successive meetings. At Evanston I found myself acting as president, without previous notice, in the absence of President Milo S. Ketchum, and had the fun of delivering his excellent presidential address,—without the labor of preparing it.

At Boston I found myself trying to bring success to a meeting of which the keynote and general plan was changed after we had come together, by the fact that our English friends with whom we were called to consult, could not stay after the first third of the meeting. Naturally the position was a difficult one.

Here, alas, at a third meeting I find myself in a difficult position. I must again deliver a presidential address and if I am to put ideas into it I must KETCHUM myself.

I thank you for the privilege you have given me to help the S. P. E. E. for a year as its president. It is a high honor as well as a privilege to be the president of a society which was "the first, and for many years the only society for the study of education in colleges" in the United States.[1]

[1] "The Study of Engineering Education," prepared for the Joint Committee on Engineering Education, by C. R. Mann, pages 101.

I thank you for your kindliness toward me during the difficult year. The past makes me feel certain that your kindliness will persist to the end of this address while we consider certain topics together.

This occasion, the Baltimore meeting of the S. P. E. E., is unique in its position in the history of the Society. We have just come out of a war which has educated us all. The war cultivated the best that was in us, and has given us new and greater ideas and ideals,—that is education. The time is favorable for readjustment in our methods in our colleges as we reëstablish our student group and our teaching staff in each institution. We have just been favored by the best objective view of colleges and engineering that has ever yet become available, the complete Joint Committee Report. Note the emphasis on the word "objective." One can secure subjective views without great difficulty, but a carefully considered objective view, such as the Joint Committee Report, is not easily secured. We have it, and have it at the opportune time.

This summer with the educative war in the background, with much new food for thought, we should renew our faith and our vigor, and focus our new knowledge and energy, with new enthusiasm, on the new tasks, and on the old familiar tasks that lie before us. We should hold fast to that which is best in our former methods and add new good things gathered from our recent experience.

Engineering is the foundation of our present civilization.

Please note that I have not said that engineering is our present civilization. Civilization is the whole structure, or perhaps I should say it is the superstructure. All of those things, ideas, ideals, which men think of as civilization, are in the superstructure which could not have been built so large or so well without the foundation, engineering. The superstructure, civilization, would fall if it were not for the solid foundation, engineering,—applied science.

Look at any part of the world where there is but little engi-

neering today, as, for example, the interior parts of Central America, away from the coasts and railroads, the interior of South America or the interior of Africa. In those places, life is for most men a struggle for the bare essentials of existence, an apathetic, listless struggle.

In sharp contrast to this, in the parts of the earth where engineering is most highly developed, the labor cost of the bare essentials of existence is greatly reduced, and man develops those luxuries which are closely related to his civilization. He has it in his power to get the bare necessities easily, in short hours. He turns the forces of nature to his own use and convenience. He travels, exchanges ideas, develops his sense of beauty and of duty, lives longer, struggles harder to go upward, develops a literature, develops social qualities, develops a religion that is based upon other foundations than mystery and fear. He becomes a civilized man, having the time and the energy to do so.

Of course, the foundation, engineering, may be used to carry some other superstructure than civilization. The Hun undertook to use engineering as a foundation for the conquest of the world. He failed because the Allies were able to use engineering as a foundation for their resistance.

The important point to keep in mind is that without the foundation, engineering, man does not have the time or energy to develop and maintain our present type of civilization. Without the engineering he cannot have the civilization. With it he has the possibility of becoming civilized, and history shows that he ordinarily makes much progress along that line.

The engineer who knows, and feels, that engineering is the foundation which carries the superstructure, our present civilization, which is something higher and better than the foundation, is naturally interested in that superstructure. He is keen to adapt his foundation to the superstructure. Naturally he is keen to see the human relations of his work and that of his profession. To him engineering is not mere technique.

Similarly the student who even dimly sees, or vaguely feels, the truth that engineering is the foundation of our present civilization is more apt than others to be permanently well motivated. He is less apt to feel that engineering is merely technique by which he may earn his way,—less apt to be narrow in his learning. He is more apt to have an impelling vision, more apt to have an interest in all that is civilization, more apt to see in the profession of engineering a glorious chance for service to mankind.

Let us not forget, even in the heat of the workday, that engineering is the foundation of our present civilization,—nor allow our students to overlook that fact.

Our slogan should be, education for service, education to bring out in each student those qualities which enable him to render greater service to mankind and to equip him with mental, moral and physical abilities for such service.

Our slogan for colleges of engineering should be, let us educate men for service as engineers.

If we adopt this slogan with the proper emphasis on the three words, men, service, engineers, we are apt to remember that each man is an organism, not a machine, that he continues to grow and change long after graduation, that we can not hope to stock him in college with all the ideas and skill he will have later, that our function in college is to help vitalize the organism, to invigorate its growth, to start it in adapting itself to its future environment. We will think less perhaps of the possible condition of that organism during the first five years after it leaves the commencement stage, and much more of the way it will be functioning in the whole period of forty years of service.

Against such a background I ask you to consider with me certain of our present oft-debated questions.

Which should receive the main emphasis, specialization or general education? The answer is, I believe, both, alternately. The most effective specialist is one who has the power and the ability to concentrate his mental pressure on so narrow a line that it is a cutting edge, who does so concentrate,

and who at the same time keeps so broad a bearing on the world that his cutting edge is properly guided. The specialist who renders greatest service is one motivated permanently by a broad vision while his attention and power is concentrated on specific tasks for which he has made himself the superior of others. He needs a broad vision to motivate him and guide him to the service most worth while. The man who is broadly cultured, and nothing more, loses his cutting edge, loses his power to concentrate, fails to have the power to do the specific tasks which are parts of his service.

It has been said in our S. P. E. E. group that all general principles are built upon specific instances and the inference carried that therefore specialization is the important thing. Others emphasize the principles as all-important and seem, in doing so, to belittle specific problems or cases.

Are not both right? Is it not true that the normal procedure of the effective, alert mind is to alternate between consideration or observation of specific concrete things or ideas on the one hand and attempting to generalize on the basis of that which is common to many things or ideas on the other hand? Does not the effective thinker normally specialize a part of the time and generalize a part of the time? Should not specialization and generalization both receive emphasis alternately in our educational procedure?

Similarly, there are those who advocate strongly the presentation of theory first,—practice, concrete examples, laboratory work later. And vice versa, there are those who advocate always taking the reverse order, the observation first and the theory later. Are they not both partly wrong and partly right? Does not the man proceed normally and most effectively by alternating the two in rather short periods? He who really observes keenly soon begins to form an understanding of what he observes and develops a partial theory. If he devotes time to formulating his understanding, to making it clear, he returns to his observing with still keener insight, and sees still more that must also be studied before being understood. Such alternation is the ideal method. As

there are thousands of facts always at hand to be observed and hundreds only among these thousands that carry by far the greater part of the significance, it is important in general to have one's attention focused on the hundreds by close attention to theory, to a true understanding. On the other hand, the theory needs always to be held in check, controlled, verified or destroyed by observation.

I believe that in general it is important to take each specific problem ordinarily from the theoretical side first, to sharpen the wits and the powers of observation, and then to observe and thereby test the theory, and possibly start a new train of thought.

I have been one of three who have spent much time during the war developing a new type of instrument. The problems encountered were exceedingly difficult. We worked by the method I have just outlined, by rapid alternation between theoretical investigation and observation. Our desks were in the laboratory where the experiments were being conducted. I can assure you that one who writes refined theory at a desk while behind him in the same room are others who are testing the crude form of that theory, writes with a care and keenness that is conducive to efficiency. So too I can assure you that he who observes under these conditions with the knowledge that if he has watched the non-essentials and missed the significant that a developing theory will soon detect his lapse,—he who so observes, observes keenly. The method of rapid alternation which was followed with the prevailing emphasis on theory first, gave a rate of progress which it is now evident was much more rapid than could possibly have been made by the observation—first method of procedure. The experience has made me a still more ardent advocate than before of the method of rapid alternations with the emphasis on theory first.

I am convinced that intelligence tests have immediate value, even now, when we know so little about them. I feel certain that they will become much more valuable when they are better understood. This statement is made in order that I

may be understood when I raise a question on one point in regard to such tests as applied to students of engineering.

It is strongly advocated that certain objective tests, which seem to me to be essentially vocational tests, should be used on engineering students. We are probably justified in being sceptical on this point. Engineering is not a narrow vocation and immediate success is not the important thing. An engineer, it is true, like all men, carries a routine load which may be specified in advance in some cases. But after all the valuable part in an engineer's service arises from his ability to see and solve new problems, to improve design, to meet the emergencies of operation, to put better methods of procedure in the place of the usual methods, to see the things that are not where he looks and which may be in the future only. The engineer's greatest service is based largely on his ability to see the things that are not obvious, to see the possible advances that are but obscurely indicated, to see in the blue-print and the description that which is a possible future fact worth while. The engineer who is of great service to the world deals, as a rule, with a great variety of things which may cover a large part of the whole range of science, including those undeveloped sciences which contain the laws of the reactions which occur in the contact of man with man, as individuals or in groups.

It seems to me that any candid study of many engineers who have rendered great service to the world will show that they exhibit great variety in their general characteristics. Among the engineers who have rendered great service are men of the artistic temperament, men with great ability at the fingers' ends and men with but little manual skill, men who have succeeded by direct attacks in person on the technical problems that came before them with little attention on the human elements in life and men who have worked almost entirely through other brains than their own, being great executives in the engineering field. There is still abundant opportunity in engineering for all of these types.

The engineers that we should aspire to educate have so broad a field, so great a variety of opportunity, such large powers of future expansion beyond their size while in college, and expansion in so many directions, that we should be sceptical of vocational tests or of objective tests of that type for them.

Please do not misunderstand. It is certain that there should be, and probably will be, much experimenting in the next few years in connection with various tests applied to students of engineering. It is only on one point in connection with the proposed tests that I have expressed skepticism. I believe that an engineer needs intelligence and must use it,—but not simply a particular kind of mechanical mathematical intelligence. Hence I believe that the future tests should aim to discover and measure intelligence,—rather than a particular brand of intelligence.

It is reasonably certain that some within hearing are thinking "that is all well and good if you are considering only the leaders in engineering, but how about the large numbers of men who do the routine work in engineering, the men who are draftsmen for life, who operate small power plants for life, or who are inspectors and remain so." The sooner we recognize that such men have not measured up to the standard of service which we recognize cordially as engineering, the better it will be for engineering education.

There is need of much clear recognition of the fact that the greatest defect in our educational system at present is the lack of vocational training. Trade-schools are needed,—trade-schools which are frankly and definitely devoted to training artisans of all grades, including the highest types, as for example, skilled draftsmen. The draftsman bears the same relation to an engineer that the trained nurse or the interne in a hospital bears to the surgeon. The trained nurse renders valuable service in that capacity for life. The surgeon's success is based on her skill and fidelity. The interne is for a time in much the same relation to the surgeon as the trained nurse. But he is developing up through that ex-

perience to become a surgeon. So also a good road to the engineer's position runs by way of temporary service at the drafting-table.

If we had well-developed, frank trade-schools, many of the best men for the routine work which is the basis of engineering would be developed in those schools, and probably the draftsmen would largely be developed there. As a result we would have better workmen, better foremen, better operators, better draftsmen. As artisans of higher grade were developed in such a well-planned system of trade-schools we would be face to face in time with even greater difficulties than now in drawing a clear, definite line to separate the highest grade of artisans from the engineers. The engineers would find the emphasis in the lines in which they served going more and more to the creative side, the improvement side. The engineer's education would in time respond still more than at present to that kind of a demand on his ability.

The establishment and frank development to their highest capabilities of trade schools for artisans would give the graduates of such schools better preparation for their future service in a shorter time than they can now get it, either by experience merely or by studying to be artisans in a college of engineering.

Permeating many of our educational problems in this society are obscurities that arise from the fact that the essential difference between the high-grade artisan and the engineer is not clearly seen and the corresponding action taken. In military life everywhere a clear distinction is seen between the private, or non-commissioned officer, and the officer. That distinction clearly seen and acted upon is effective both in contributing to the efficiency of the organization and in developing the individual in it.

As in military life, the exceptional men frequently pass from one of these classes to the one above, from the non-commissioned to the officer class, so we should expect even though we had the ideal educational system, that exceptional men, trained as artisans would rise to the professional class.

The point is that both the education and the performance would be improved by recognizing frankly both classes as distinct, just as it is certain that in the Army and Navy frank recognition of the officers and of the non-commissioned officers as being in distinct classes contributes to raising the quality of their service and of their training.

During the war it has been impressed very strongly upon our attention that under the spell of a nation wide unanimous purpose our young men were so strongly motivated that they showed powers much greater than we had supposed them to possess. Every young man had an abiding fierce determination to fight the Hun. He was ready and willing to take any discipline or do anything required that would help him along the line of his determination. When he saw his chance in the form of a specific task,—as a motor mechanic, an aviator, or a radio expert he took the essentials of that specific training with most astonishing vim and rapidity.

It is important that, as educators, we should see the meaning of this experience in true perspective,—that we should not draw false, or unbalanced, conclusions from it, as we attempt to apply war time experience to times of peace. We have had the strictly military view of the matter presented to us very fully and very vigorously, during the war, and at this meeting.

I desire to raise and emphasize three broad questions arising out of the war experience. First, In the next ten years in our colleges of engineering will the successful motivation of our students be a military motivation, or a motivation in some other line? Second, Is it possible to get a real speeding up in the education of engineers in time of peace that shall correspond to that which was secured in the training of men for specific tasks in war time? Third, Is it our patriotic duty to train all, or large numbers, of our students to be military engineers? Or will we serve the nation still better if we educate them thoroughly as engineers and let them get at college or in camps whatever small amount of the essentials of strictly military knowledge experience may show each man

should have,—but get it without interruption of their engineering education or distortion of that education.

Our young men under the spell of the unanimous determination to fight the Hun had an extremely strong military motivation. Did that motivation show a sudden lapse when the armistice was signed? Are the young men now in college showing the intense motivation toward military occupations that they did in 1917 and 1918? Should they show such a motivation now if they see things rightly? Is the task now imminent before us in the world essentially military,—or essentially a peace task? Consider the mental attitude of the boys now in college. Do they take to military training with avidity? Is not the military motivation for engineering students largely a thing of the past? As motivation is extremely important to our success as educators should we develop a new motivation in the place of the lost military motivation,—or take advantage of whatever motivation now exists in nascent state in our young men? A frank and full consideration of these queries will also furnish a true answer to that first question, which was "In the next ten years, in our colleges of engineering, will the successful motivation of our students be a military motivation, or a motivation in some other line?"

Next, Is it possible to get a real speeding up in the education of engineers in time of peace that shall correspond to that which was secured in the training of men for specific tasks in war time? Education is essentially a slower process than training. The more specific and narrow the task for which a man is to be training the more quickly he may be trained. Each piece of war time training was purposely and rightly made as specific as possible. An engineer needs an education which shall fit him for a large variety of somewhat vague tasks. To train a man to do things at once thus and so,—is an undertaking which lends itself readily to a speeding up. But it is a much harder task and one which is essentially much slower, to educate a man so that he will think. That is what we must do for our future engineers. Let us keep these things in mind, and apply the necessary correction factors, when-

ever it is tacitly assumed, or openly asserted, that the war experience in training for specific tasks with great speed shows that we may educate engineers in a much shorter time than we have in the past. Of course we can do better than we have in the past,—but education cannot be speeded up to the same limit as special training.

In discussions as to possible changes in our educational system one tacit assumption frequently made is that it is our patriotic duty to put much of a military complexion into our training of engineers, that it is our patriotic duty to pay considerable attention to military engineering in the training of engineering students. I challenge that assumption. I believe it to be clearly a mistake and have indicated my belief in the third question,—"Is it our patriotic duty to train all, or large numbers of our students to be military engineers? Or will we serve the nation still better if we educate them thoroughly as engineers and let them get at college or in camps whatever small amount of the essentials of strictly military knowledge experience may show each man should have,—but get it without interruption or distortion of their engineering education."

In the war just ended the original engineer arm of the United States Army was increased to 131.5 times its pre-war strength. Eleven per cent. of our total force was made up of engineer troops. On the face of it this means that as a patriotic duty we should train an extremely large number of military engineers. But is that the correct conclusion? The expansion was made by taking men educated for engineering, and with experience as engineers in practice, for officers, and using for the rank and file in engineering troops, artisans in engineering lines with a peace time occupation similar to that which was to be theirs in war. It was found to be both an easy and a short task to give them, the officers and the men, the essentials of strictly military knowledge. They did their war work well and promptly. In general throughout this war, in so far as the United States was concerned, the greatest shortage was never in trained officers and men. It was in transportation and materials. The higher the development

of engineering in peace time in a given nation the more quickly these shortages of transportation and of materials can be met. Our engineers in war faced the same problems as they had been accustomed to in times of peace. If we train our future engineers to solve the problems of peace more thoroughly we will be doing much more to increase their effectiveness in war than by giving them in advance a little smattering of so-called military engineering. The great principles of military strategy remain the same throughout all ages. But the tools and the tactical methods of war change each generation with the advance of applied science and are conditioned on the state of that advance. We as engineering educators shall contribute more to the national welfare by raising the state of the art, engineering, than we can in any other way.

In the process of doing our best for engineering, by improving engineering education while we hold fast to that which is excellent in our present methods, we should of course welcome any enrichment of courses and improvement of methods which may come from our military experience or our military arms.

Our greatest service to the nation will be to do our best to make this nation foremost in engineering in time of peace,—and therefore foremost in military engineering in time of war when, and if, war shall come. Our service will be of the highest type if there is ever before us the realization that engineering is the foundation of our civilization,—if we realize that we make a better superstructure possible when we build the foundation better,—if we realize that our part is ever to foster a better, broader, more thorough engineering education than has ever yet been given.

MINUTES OF THE TWENTY-SEVENTH ANNUAL MEETING.

THE JOHNS HOPKINS UNIVERSITY, BALTIMORE, MD.
JUNE 25–28, 1919.

The twenty-seventh annual meeting of the Society for the Promotion of Engineering Education was held at The Johns Hopkins University, Baltimore, Md., June 25 to 28, 1919. The sessions were held in the Mechanical and Electrical Engineering Building.

MINUTES OF THE REGULAR SESSIONS.

WEDNESDAY, JUNE 25.

Opening Session.

The meeting was called to order at 2:00 P.M. by President John F. Hayford, Director of the College of Engineering, Northwestern University. President Frank J. Goodnow of The Johns Hopkins University welcomed the Society to the University and President Hayford responded for the Society.

The Special Committee appointed to make a study of the report of the Joint Committee on Engineering Education reported at this time followed by two papers dealing with this subject: "Mental Tests for Engineering Students," by L. L. Thurstone, and "Vocational Intelligence Examination to IV Year M. E. Students," by Wm. T. Magruder. A discussion followed.

The President announced the following as members of the Committee on Resolutions: O. M. Leland, *chairman*, R. S. King and W. H. Burger.

THURSDAY, JUNE 26.

Second Session.

The meeting was called to order at 9:30 with President Hayford in the chair. A list of seventeen individual and one institutional applicants, which had been approved by the Council, was favorably acted upon by the Society.

Professor C. F. Allen presented a paper on "The Case System for the Study of Law; What it is, and its Bearing on Engineering Education." Professor A. H. Fuller presented the report of Committee No. 15, Civil Engineering, followed by the paper on "Effect of the War on Engineering Education" by Dean Anson Marston.

The Committee appointed by the Council to consider the desirability of encouraging the formation of sections in the Society reported as follows:

1. That the Society authorize and encourage the formation of sections in cities, states or other geographic divisions.
2. The objects of these sections are to advance the ideals and standards of engineering education and to increase interest in the activities of the S. P. E. E.
3. Sections may be formed in any locality by temporary organizations which shall become duly authorized sections of the S. P. E. E. upon approval by the Council.
4. Sections shall not expend any of the Society's funds; they shall be self supporting.

(signed) J. T. FAIG,
W. E. MOTT,
A. A. POTTER, *Chairman.*

This report was favorably acted upon by the Society.

Third Session.

The meeting was called to order by President Hayford at 2:00 P.M. Col. F. J. Morrow read a paper on "Military Training in Engineering Schools." In the absence of President Charles S. Howe, Chairman of the Committee of this Society to coöperate with the Committee on Education and Special Training in this work, the Secretary read the report of this committee. It was regularly moved and carried that this Committee be enlarged by the addition of two more members and that they meet with the Committee on Education and Special Training in Washington, Monday, June 30, 1919.

Major Harrison Tilghman read a paper on "The Coast Artillery and the Reserve Officers Training Corps." The following resolution was unanimously adopted. A motion that this Society present to Colonal Morrow and to Major Tilghman and the other officers present a vote of thanks and high appreciation for the papers and the information that they had given, and that we express through them to the War Department the purpose of the engineering schools of this country to do all they can to back up the movement for insuring the preparedness of America in case of future difficulties.

Dean E. F. Coddington read the report of Committee No. 8, Admission; the Secretary read the report of Committee No. 11-A, Physics, in the absence of the chairman, Professor G. W. Stewart. Professor C. W. Park, Miss Sada A. Harbarger and Professor J. Raleigh Nelson presented the report of Committee No. 12, English. The paper, "The Unconscious Plagiarist," by G. I. Mitchell, was read by title. Professor O. A. Leutwiler presented the report of Committee No. 16, Mechanical Engineering. Professor George W. Case presented an illustrated paper on "Teaching Safety in Engineering Schools."

The report of Committee No. 17, Electrical Engineering, was read by title. Professor F. W. Sperr presented the report of Committee No. 18, Mining Engineering, and President John

T. Faig presented the report of Committee No. 20, Standardization of Technical Nomenclature.

FRIDAY, JUNE 27.

Fourth Session.

The meeting was called to order at 9:30 with President Hayford in the chair. Past-President George R. Chatburn presented a paper, "The Society for the Promotion of Engineering Education. A Survey of its Past and a Reconnaissance of its Future." Dean E. O. Leuschner read his paper on "Degrees," which lead to the motion that a committee of five be appointed to make a study of degrees.

Excursions.

SATURDAY, JUNE 28.

Fifth Session.

The meeting was called to order by President Hayford at 9:00 A.M. Professor Edward J. Kunze presented a paper, "The Vitalizing Principles in Education." In the absence of Professor O. J. Ferguson, his paper, "Vocational Correlation," was read by title. The treasurer, Mr. W. O. Wiley, presented his report which upon motion was accepted. The secretary presented his report and upon motion it was accepted and to be printed in the PROCEEDINGS as read.

The Committee on Resolutions reported as follows:

WHEREAS, the investigations resulting in the report by Dr. C. R. Mann, entitled "A Study of Engineering Education," constitute a most valuable contribution to the work which it is the object of this Society to promote, therefore, be it

Resolved, that the thanks of this Society are due the Carnegie Foundation for the Advancement of Teaching for its generosity in providing the means of carrying on the investigations and publishing the report; to the president and directors of the Foundation for their personal interest and coöperation; and to Dr. Mann for his masterly and comprehensive treatment of the subjects considered; and further be it

Resolved, that this Society expresses its appreciation of the assistance of the other national societies represented on the Joint Committee for the prosecution of this work, namely, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Chemical Society, the American Institute of Chemical Engineers, and the American Institute of Mining Engineers, and further be it

Resolved, that the Secretary of this Society transmit to the above organizations and to Mr. Andrew Carnegie copies of these resolutions.

Resolved, that the cordial thanks of the Society be extended to the President, the members of the several local committees, and the ladies of The Johns Hopkins University for the hearty welcome and courteous and kindly treatment which have been accorded the members of the Society; and for the use of the buildings and accommodations which have been such a factor in making this meeting so pleasant and profitable; further be it

Resolved, that the Secretary be instructed to convey to the officers of the Baltimore Country Club the appreciation of the Society for their hospitality in extending the courtesies of the Club; further be it

Resolved, that the thanks of the Society be transmitted to the Superintendent of the United States Naval Academy for the entertainment of the Society at Annapolis, and further be it

Resolved, that the Society thanks those officers of the United States Army who, in the pressure of official duties, took the time to be present at this meeting, in order to furnish information concerning subjects which are of such great moment to the work of the engineering colleges at the present time.

The Nominating Committee reported as follows:

For officers to serve one year:

For President: Arthur M. Greene, Jr., Rensselaer Polytechnic Institute.

For Vice-Presidents: A. A. Potter, Kansas State Agricultural College, F. P. McKibben, Union College.

For Secretary: F. L. Bishop, University of Pittsburgh.

For Treasurer: W. O. Wiley, New York City.

For members of the Council to serve for three years: H. S. Boardman, University of Maine; F. C. Bolton, Agricultural and Mechanical College of Texas; E. F. Coddington, The Ohio State University; W. H. Kavanaugh, University of Pennsylvania; C. C. More, University of Washington; E. H. Rockwell, Tufts College; W. S. Rodman, University of Virginia.

On motion, the Secretary was instructed to cast a unanimous ballot in favor of all the above candidates.

President Ira N. Hollis read his paper, "Engineering Colleges and their Administration." The resolution proposed in the report of the secretary that "a standing joint committee should be provided to coördinate the educational activities of the engineering societies with this Society, thus preventing useless duplication and at the same time bringing this Society in contact in the best possible manner with technical societies" was adopted. Dean Gardner C. Anthony read his paper, "The New Course at Tufts College," followed by Dean J. R. Benton, Dean A. A. Potter, Professor J. C. Tracy, Professor F. C. Bolton, Major C. C. More. In the absence of Professor R. M. Bird, the Secretary read the report of Committee No. 11-B, Chemistry. Professor O. H. Basquin presented the report of Committee No. 13, Mechanics and Hydraulics, and Professor C. C. Williams the report of Committee No. 14, Economics. Professor Collins P. Bliss presented his paper, "Visual Industrial Course." President Hayford introduced the new president, Arthur M. Greene, Jr., who graciously accepted the office. The convention then adjourned *sine die.*

MINUTES OF COUNCIL MEETINGS HELD JUNE 25, 26 AND 28, 1919.

Meetings of the Council were held on June 25, 26 and 28. Members who attended one or more meetings were: C. F. Allen, Gardner C. Anthony, F. L. Bishop, A. H. Blanchard, Wm. Hand Browne, George R. Chatburn, John T. Faig, John F. Hayford, Dugald C. Jackson, O. A. Leutwiler, Wm. T. Magruder, W. E. Mott, E. J. McCaustland, F. W. McNair, J. Raleigh Nelson, A. A. Potter, T. U. Taylor, C. J. Tilden and W. O. Wiley.

The motions passed were as follows:

1. That the invitation of the St. Louis Chamber of Commerce to hold the next meeting of the Society in St. Louis on May 24 to 27, 1920, not be accepted due to the fact that the time set is impracticable for the majority of institutions.

2. That the Secretary investigate the subject of associate editors in connection with the BULLETIN of the Society, and report at the next meeting.

3. That it is the policy of the Society that only members of the Society be appointed to serve on committees.

4. That a committee of Council be appointed to take up the subjects of sections in the Society and report. This committee reported as follows:

The Committee appointed by the Council to consider the desirability of encouraging the formation of sections, begs to report as follows:

1. That the Society authorize and encourage the formation of sections in cities, states or other geographic divisions.

2. The objects of these sections are to advance the ideals and standards of engineering education and to increase interest in the activities of the Society for the Promotion of Engineering Education.

3. Sections may be formed in any locality by temporary organizations which shall become duly authorized sections of the Society for the Promotion of Engineering Education upon approval by the Council.

4. Sections shall not expend any of the Society's funds; they shall be self-supporting.

Respectfully submitted,

J. T. FAIG,
W. E. MOTT,
A. A. POTTER.

This report was presented to the members at the meeting Thursday and adopted.

5. That the institutional delegate from each institution be appointed by the Council as a special delegate from his institution to see to the increase of membership during the coming year.

6. That the Council appoint and request a member from each institution having members in the Society, to see to the increase of membership during the coming year.

7. That the next meeting of the Society be held in an institution in the Middle West in June, the place to be decided by the Council.

8. That three members of the Society be elected to represent the Society on the American Council on Education. The following were elected:

C. R. Mann, to serve for one year;
F. W. McNair, to serve for two years;
F. L. Bishop, to serve for three years.

9. That a committee be appointed to study the bill relating to the loaning of equipment owned by the War Department to educational institutions and report to the Council. The following resolution was presented and upon motion adopted and the Secretary instructed to send a copy to the author, Mr. Caldwell, who introduced H. R. 3142 into the 66th Congress, May 26, 1919:

The Council of the Society for the Promotion of Engineering Education believes it desirable that machine tools and scientific equipment owned by the War Department, not in use for Government purposes, be used for increasing the educational facilities of trade and technical schools, colleges and universities. It believes also that such tools and equipment

can be made most useful by outright sale to the institutions at nominal prices, instead of by loans, for the reason that loans will introduce administrative difficulties on the part of the Government and institutions, which will place an unnecessary financial burden on both. Institutions obtaining machine tools and scientific equipment from the Government at nominal prices should obligate themselves not to sell these for a period of at least seven years from date of sale.

(signed) DUGALD C. JACKSON,
A. A. POTTER,
E. J. MCCAUSLAND,
J. T. FAIG.

10. That the report of the treasurer be accepted and recommended to the meeting for adoption.

11. Following the recommendation of the Treasurer, Mr. Wiley, the following action was taken:

That the Secretary's office take over the collection of dues this year, and the other recommendations from Mr. Wiley be carried out as soon as possible.

12. The following applicants were recommended to the Society for election:

Abbott, Robinson; Baker, Ray Palmer; Burbank, Colby Lewis; Frey, George John; Gregg, John M.; Hill, A. S.; Jenkins, A. L.; June, Henry Norton; Mann, Horace Tharp; Reybold, Eugene; Roberts, Emerson; Seavey, Frank Elias; Shank, Jacob Ralph; Sheehan, Thomas W.; Thurston, L. L.; Tilghman, Harrison; Watt, Homer A.; Weaver, Rudolph; Williams, J. P. J.; The Harvard Engineering School, Harvard University, Cambridge, Mass.; The University of Texas, Austin, Tex.

13. The following budget of income and expense for the coming year was reported by the Executive Committee and adopted by the Council:

ESTIMATED RECEIPTS.

From current dues, individual	$5,252.00
From current dues, institutional	700.00

From back dues	700.00
From advertising	1,000.00
From sale of publications	250.00
Estimated receipts	$7,902.00

ESTIMATED EXPENSE.

A.	Baltimore meeting (1919)	$300.00	
B.	PROCEEDINGS, Vol. 27	1,200.00	
C.	ENGINEERING EDUCATION, Vol. X	1,600.00	
D.	Committee Expenses	150.00	
E.	Treasurer's honorarium	300.00	
F.	Secretary's honorarium	1,000.00	
H.	Clerical assistant	1,200.00	
I.	Sundry printing	250.00	
J.	Postage and expressage	275.00	
K.	Telephone and telegraph	50.00	
F.	Office supplies	125.00	$6,450.00
	Estimated surplus		$1,452.00

The Officers elected for 1919–20 are:

President: Arthur M. Greene, Jr., Rensselaer Polytechnic Institute, Troy, N. Y.

Vice-Presidents: A. A. Potter, Kansas State Agricultural College, Manhattan, Kans.; F. P. McKibben, Union College, Schenectady, N. Y.

Treasurer: W. O. Wiley, 432 Fourth Avenue, New York, N. Y.

Secretary: F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

Members of the Council to serve for three years (1919–1922): H. S. Boardman, University of Maine, Orono, Me.; F. C. Bolton, A. & M. College of Texas, College Station, Tex.; E. F. Coddington, The Ohio State University, Columbus, O.; W. H. Kavanaugh, University of Pennsylvania, Philadelphia, Pa.; C. C. More, University of Washington, Seattle, Wash.; E. H. Rockwell, Tufts College, Tufts College, Mass.; W. S. Rodman, University of Virginia, University, Va.

EDITORIAL.

One of the most urgent demands of the present hour is for the same thing which made the war a success to the allies: co-operation. The requirements of the strenuous war period to which we acceded with good grace are just as necessary to-day when the world seems upsidedown with each grasping for the greatest personal gain. If the great tangle in the industrial world is to be straightened out the same spirit of coöperation must be continued and a sane view must be taken by each person.

This spirit of coöperation should exist between our organization as teachers or those interested in education and the consumers of our product, the manufacturers and industrial managers. Indeed one of the objects in bringing into our Society the business man and the engineer as well as the teacher was to have coöperation between those who train the student engineer, those who guide the post-graduate and those who employ him.

Should we not endeavor to sound each other and find out if we can coöperate more fully than in the past? Can we not try to obtain the viewpoint of each other and thus see why we do not always agree? There are demands made on the schools to specialize more by those who have forgotten the importance of their early training in the underlying principles. They remember only the importance of their special work, arrived at after training in the fundamentals. A word from the teacher may clear this matter. The engineering teacher does not see the importance of social science or business methods of a fundamental nature. A discussion by the manager will make this evident.

May we not have some expressions of viewpoints, of needs, of fallacies as they appear to us? These are to be made not in the spirit of destructive criticism but for constructive co-operation.

ARTHUR M. GREENE, JR.,
President.

SECTIONS OF THE S. P. E. E.

BY A. A. POTTER,

Vice-President and Chairman of Sections Committee.

At the Baltimore meeting of the S. P. E. E. the Society voted—

1. That the Society authorize and encourage the formation of sections in cities, states or other geographic divisions.

2. The objects of these sections are to advance the ideals and standards of engineering education and to increase interest in the activities of the S. P. E. E.

3. Sections may be formed in any locality by temporary organizations which shall become duly authorized sections of the S. P. E. E. upon approval by the Council.

4. Sections shall not expend any of the Society's funds; they shall be self-supporting.

J. T. Faig,
W. E. Mott,
A. A. Potter,
Committee.

The institutional delegates were requested to aid in the formation of sections in their localities, and in accordance with the above action of the Society.

It is the intention of the Society to encourage attendance at the sectional meetings of all persons interested in engineering education; including members of the S. P. E. E., as well as non-members, engineering teachers, teachers of non-engineering subjects, engineering practitioners, and people connected in any capacity with the industries as well as with various types of educational institutions.

Meetings of the sections should be held quarterly or, preferably, monthly. When convenient these meetings should be

held in conjunction with other engineering or educational organizations. As an illustration, the meetings of the S. P. E. E. Section for the State of Ohio would be held one time in Columbus immediately preceding or following the Annual Meeting of the Ohio Engineering Society. Another meeting of the Ohio Section may be held at Cleveland in connection with some important meeting of the Cleveland Engineering Society, etc.

The following advantages will result from the sectional meetings of the S. P. E. E.:

1. Opportunities will be offered for engineering teachers to become acquainted, under favorable circumstances, with men they ought to know.

2. The efficiency of engineering instruction will be increased through the mutual interchange of ideas and by the discussion of engineering education. Reviews and discussions of the Society's publications, as well as educational articles of other organizations, will tend to extend the horizons of the experience of those in attendance, while arousing their interest in improving the standards of engineering education.

3. Teachers will become familiar with the problems confronting other educational institutions and this should result in fostering greater coöperation among institutions in the same locality.

4. The sectional meetings will increase the influence of the S. P. E. E. by making larger numbers familiar with the Society's aims and standards. This should result indirectly in bringing into the membership of the Society all those who are keenly interested in the greatest development of the engineering profession.

Those who are attending regularly the annual meetings of the S. P. E. E. feel that the inspiration which they receive every time is of the greatest value to them in their work. Unfortunately, only a small percentage of the members can avail themselves of the stimulus resulting from the attendance at such meetings. The organization of sections will bring all

engineering teachers in closer touch with the problems confronting engineering education.

It is hoped that sections will be started without delay in several localities. The mode of procedure is to call an organization meeting and have all those attending sign a petition to the Council of the S. P. E. E. At the same time temporary officers are chosen to have charge of the section's activities. The petition is forwarded to Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa., the Secretary of the Society, who will transmit the petition to the Council for approval.

INSTITUTIONAL DELEGATES OF THE SOCIETY.*

A. A. Potter, Chairman, Kansas State Agricultural College, Manhattan, Kans.
A. F. Barnes, New Mexico A. & M. College, State College, N. M.
F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.
H. S. Boardman, University of Maine, Orono, Maine.
F. C. Bolton, A. & M. College of Texas, College Station, Tex.
W. H. Burger, Northwestern University, Evanston, Ill.
G. M. Butler, University of Arizona, Tucson, Ariz.
G. A. Covell, Oregon Agricultural College, Corvallis, Ore.
F. T. Dargan, Clemson College, Clemson College, S. C.
H. L. Dodge, State University of Iowa, Iowa City, Iowa.
H. S. Drinker, Lehigh University, Bethlehem, Pa.
S. B. Earle, Clemson College, Clemson College, S. C.
John T. Faig, Ohio Mechanics Institute, Cincinnati, Ohio.
J. H. Felgar, University of Oklahoma, Norman, Okla.
A. H. Fuller, Lafayette College, Easton, Pa.
L. A. Hazeltine, Stevens Institute of Technology, Hoboken, N. J.
A. Lewis Jenkins, University of Cincinnati, Cincinnati, Ohio.
W. H. Kavanaugh, University of Pennsylvania, Philadelphia, Penna.
R. S. King, Georgia School of Technology, Atlanta, Ga.
A. S. Langsdorf, Washington University, St. Louis, Mo.
A. O. Leuschner, University of California, Berkeley, Calif.
E. J. McCaustland, University of Missouri, Columbia, Mo.
F. W. McNair, Michigan College of Mines, Houghton, Mich.
Anson Marston, Iowa State College, Ames, Iowa.
Chas. C. More, University of Washington, Seattle, Wash.
J. R. Nelson, University of Michigan, Ann Arbor, Mich.

* This list is of September 1st. It will be completed for the October number.

H. N. Ogden, Cornell University, Ithaca, N. Y.
A. A. Potter, Kansas State Agricultural College, Manhattan, Kans.
N. C. Riggs, Carnegie Institute of Technology, Pittsburgh, Pa.
Max B. Robinson, University of Akron, Akron, Ohio.
E. H. Rockwell, Tufts College, Tufts College, Mass.
W. S. Rodman, University of Virginia, University, Va.
H. B. Shaw, Doherty Training Schools, Toledo, Ohio.
C. H. Snow, New York University, New York, N. Y.
W. E. Stone, Purdue University, LaFayette, Ind.
O. V. P. Stout, University of Nebraska, Lincoln, Nebr.
T. U. Taylor, University of Texas, University, Texas.
R. G. Thomas, The Citadel, Charleston, S. C.
A. A. Titsworth, Rutgers College, New Brunswick, N. J.
John C. Tracy, Sheffield Scientific School of Yale University, New Haven, Conn.
J. W. Votey, University of Vermont, Burlington, Vt.
P. F. Walker, University of Kansas, Lawrence, Kans.

COMMITTEES OF THE SOCIETY.

A large part of the work of the Society is conducted by committees under the direction of a Committee on Committees and their work for the year 1919–20 are:

1. Executive Committee: Arthur M. Greene, Jr., W. O. Wiley and F. L. Bishop.

2. Publication Committee: Arthur M. Greene, Jr., W. O. Wiley and F. L. Bishop.

3. Program Committee: Arthur M. Greene, Jr., A. A. Potter, F. P. McKibben, W. O. Wiley and F. L. Bishop.

Committees Nos. 1, 2 and 3 have their work defined by the By-Laws of the Society.

4. Committee on Committees: Arthur M. Greene, Jr., W. O. Wiley, A. A. Potter, F. P. McKibben, Henry S. Jacoby, C. R. Mann and F. L. Bishop.

7. Institutional Committee: A. A. Potter, Chairman, A. F. Barnes, F. L. Bishop, H. S. Boardman, F. C. Bolton, G. M.

Butler, G. A. Covell, F. T. Dargan, H. L. Dodge, H. S. Drinker, S. B. Earle, John T. Faig, J. H. Felgar, A. H. Fuller, L. A. Hazeltine, A. Lewis Jenkins, W. H. Kavanaugh, R. S. King, A. S. Langsdorf, A. O. Leuschner, E. J. McCaustland, F. W. McNair, Anson Marston, Chas. C. More, T. R. Nelson, H. N. Ogden, N. C. Riggs, Max B. Robinson, E. H. Rockwell, W. S. Rodman, H. B. Shaw, C. H. Snow, W. E. Stone, O. V. P. Stout, T. U. Taylor, R. G. Thomas, A. A. Titsworth, John C. Tracy, J. W. Votey, P. F. Walker.

To bring the policies of the Society to the attention of the executives and other teachers in their institutions and to represent the Society at the institutions.

8. Committee on Admission: A. A. Potter, Chairman, J. W. Hallock, C. E. Magnusson and C. M. Wirick.

Study of the methods of admission to engineering schools including European schools.

9. Committee on Administration: F. P. McKibben, Chairman, W. G. Raymond, John T. Faig.

10. Committee on Mathematics: L. C. Plant, Chairman, E. R. Hedrick and C. E. Comstock.

Coöperate with the American Mathematical Association.

11-A. Committee on Physics: G. W. Stewart, Chairman, F. K. Richtmyer, Barry MacNutt and H. H. Higbie.

Study of the first course in Physics.

11-B. Joint Committee on Chemistry: R. M. Bird, Chairman.

American Chemical Society: H. P. Talbot, S. W. Parr and R. H. McKee.

Society for the Promotion of Engineering Education: R. M. Bird, J. H. James and J. R. Withrow.

12. Committee on English: C. W. Park, Chairman, J. R. Nelson, Sada Harbarger and Frank Aydelotte.

Continue the study of the present status of the teaching of English to engineers.

13. Committee on Mechanics and Hydraulics: O. H. Basquin, Chairman, J. E. Boyd, C. H. Burnside, H. F. Moore and C. I. Corp.

The main objectives in teaching these subjects.

14. Committee on Economics: C. C. Williams, Chairman, A. B. McDaniel, P. F. Walker, J. W. Dietz and E. B. Paine.

Work defined by Committee.

15. Committee on Civil Engineering: A. H. Fuller, Chairman, W. C. Huntington, H. J. Burt, C. T. Morris and J. Hammond Smith.

Methods and details of teaching structural design.

16. Committee on Mechanical Engineering: W. W. Bird, Chairman, B. W. Benedict, W. W. Carlson, H. Wade Hibbard, A. Lewis Jenkins and A. L. Williston.

Methods of teaching shop work.

17. Committee on Electrical Engineering: C. F. Harding, Chairman, O. J. Ferguson, Alexander Gray, H. E. Dyche, F. T. Dargan, E. J. Berg and H. B. Shaw.

A study of the present practice in regard to the teaching of direct currents and alternating currents versus the teaching of the electrical currents.

18. Committee on Mining Engineering: F. W. Sperr, Chairman, E. A. Holbrook, J. B. Porter, H. H. Stoek and F. A. Thomson.

Continue present investigations.

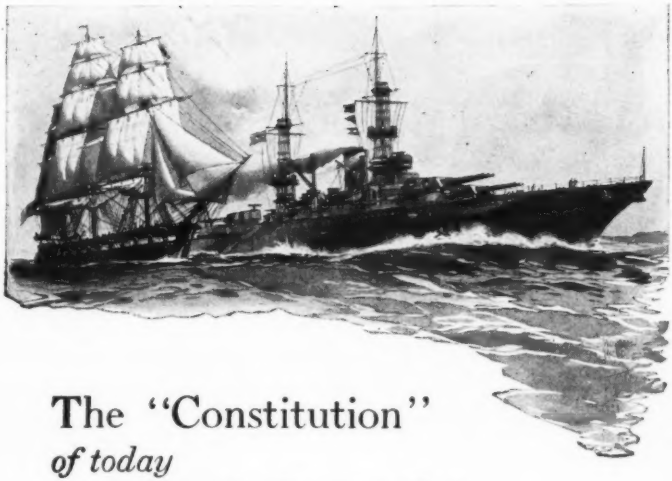
20. Committee on the Standardization of Technical Nomenclature: John T. Faig, Chairman, W. D. Ennis, F. N. Raymond, Chas. Warren Hunt and S. E. Moss.

21. Committee on R. O. T. C.: Charles S. Howe, Chairman, C. Russ Richards, F. P. McKibben, A. E. Burton, W. M. Thornton, A. L. Williston, F. L. Bishop.

To coöperate with the War Department.

22. Committee on Intelligence Tests: L. L. Thurston, Chairman, Wm. T. Magruder, Anson Marston, Dugald C. Jackson and C. R. Dooley.

23. Committee to Coöperate with the American Society of Mechanical Engineers: C. L. Mees, Chairman, A. B. McDaniel, W. S. Rodman, E. S. Fessenden and L. M. Defoe.



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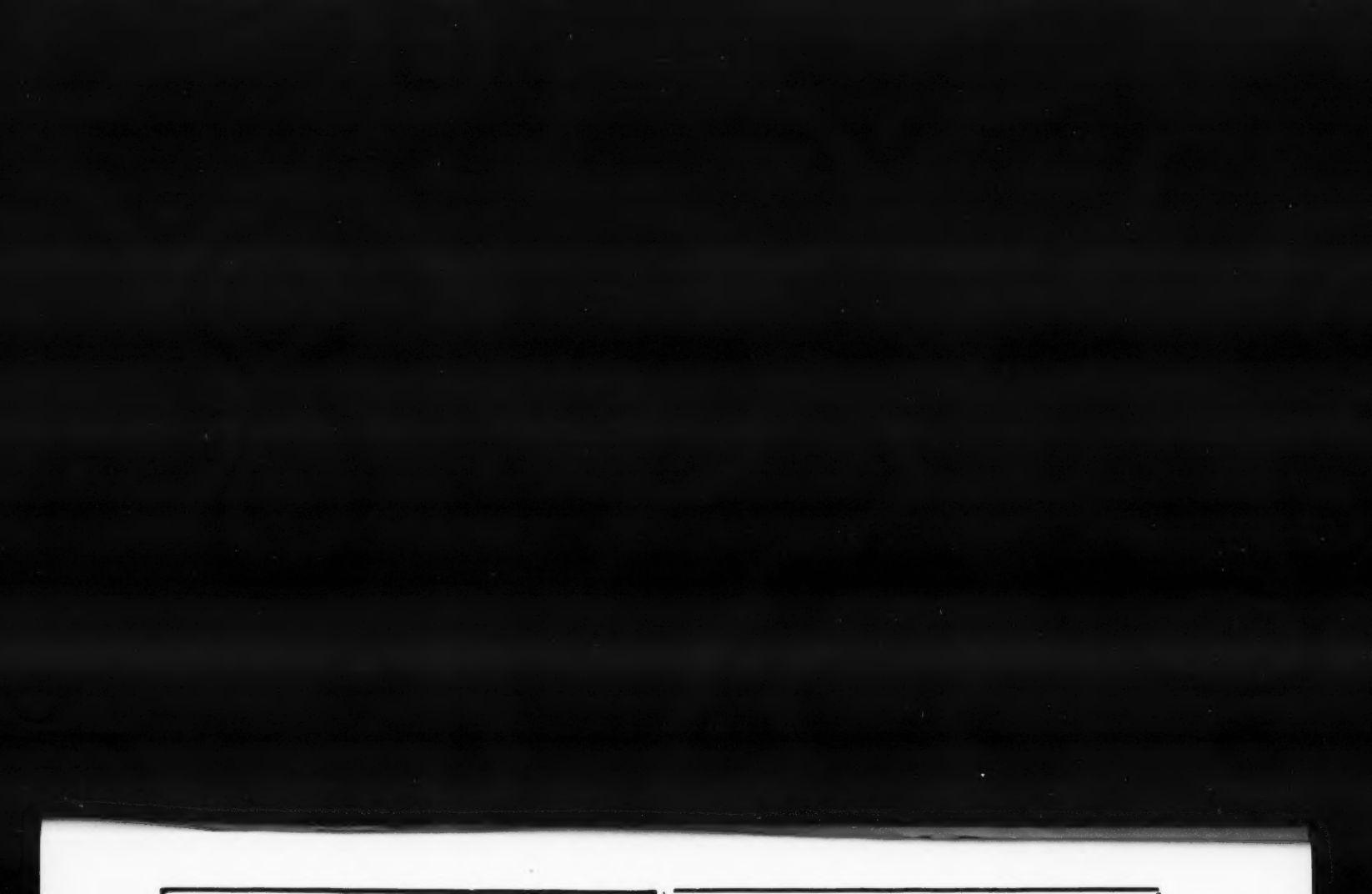

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Ready September 15th

These books have been arranged to meet the needs of the two-year schedule in elementary physics which has been recently adopted at many of our technical schools, and in the authors' opinion most of the added emphasis which this two-year schedule involves should be directed towards the mathematical side, or let us say, the mathematical bottom of the subject.

The two-year schedule in elementary physics, beginning with the Freshman year, means that teachers of physics cannot base their work upon college courses in mathematics to the extent that might have been possible heretofore; but the authors believe, nevertheless, that teachers of physics can and should make use of the more powerful mathematical methods from the beginning. Accordingly differential and integral calculus are used throughout these new texts, but without demanding the previous study of calculus by the student.

The central idea underlying these new texts is that mathematical training must be accomplished by the combined efforts of teachers of mathematics and teachers of physics, and it is hoped that these new texts will help to bring teachers of physics to what the authors believe to be their proper function in the important and difficult matter of mathematical training. If our students were to come from their mathematics teachers fully able to use their mathematics there would be nothing left for the rest of us to do!

The central purpose of these new texts is to facilitate class-room work. Descriptive and explanatory material has been reduced to a minimum; the development of every topic leads as directly and quickly as possible to illustrative numerical problems; and everything is arranged in strict lesson order.

Lessons in Mechanics contains material of interest to teachers of mathematics.

Lessons in Electricity and Magnetism contains material of interest to teachers of electrical engineering.

Teacher's examination copies sent postpaid on approval at 20 per cent. off list.

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